Application No.: 09/198,849 Docket No.: Y1929.0047/P047

REMARKS

Claims 10-19, 21-22 and 25-52 are pending and have been examined in the present application.

Claims 10-19, 21-22 and 25-52 stand rejected under 35 U.S.C. § 102(a) as being anticipated by Applicant's admitted prior art described on pages 1-3 of the present specification. Applicant respectfully traverses this rejection.

Each of independent claims 10, 27, 51 and 52 require that the device is at least partially submerged in a liquid when the device is joined to the substrate. This feature is neither disclosed nor suggested in Applicant's admitted prior art described in the present specification. As specifically described at pages 1-3 of the present application, and shown in Figs. 2A and 2B, the device of the prior art is attached to the substrate in air, and not in a liquid as required by independent claims 10, 27, 51 and 52. Accordingly, as each and every limitation as defined in claims 10-19, 21-22 and 25-52 is neither disclosed nor suggested in the prior art of record, reconsideration and withdrawal of this rejection is respectfully requested.

Claims 10-19, 21-22 and 25-52 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over JP(I) in view of Sliwa (U.S. Patent 4,990,462) and Sherry (U.S. Patent 4,763,829). Applicant respectfully traverses this rejection.

Claims 10-19, 21-22 and 25-26

Among the limitations of independent claim 10 which are neither disclosed nor suggested in the prior art of record is a method of joining a substrate and a device which includes:

> "positioning said device electrode so as to contact said opposite surface of said solder bump such that the center of said device electrode is not aligned with the center of said substrate electrode while said device is at least partially submerged in said liquid;" and
>
> "aligning the center of said device electrode with the center of said substrate electrode by surface tension of said solder bump when said solder bump is melted and while said device is at least partially submerged in said liquid and at least partially supported by a buoyant force thereby joining said device electrode and said substrate electrode to each other".

The JP(I) reference discloses a method of joining a semiconductor element to a substrate while placing them in a saturated vapor or a heated inactive solvent. JP(I) teaches that the semiconductor element 10 and substrate 13 are supported on a upper jig 14 and a lower jig 15 and pressurized against each other, and then "dipped" into the saturated vapor or inactive solvent for bonding together with eutectic solder 12.

JP(I) does not mention that the center of the device electrode is not aligned with the center of the substrate electrode while the device is at least partially submerged in the liquid. Actually, the method disclosed in JP(I) teaches away from placing the centers of the respective electrodes out of alignment because JP(I) specifically teaches that the semiconductor element and the substrate are forced together (pressurized) by upper and lower jigs, respectively. As a result, the center of the device electrode is actually aligned

with the center of the substrate electrode before they are joined. Therefore, inasmuch as JP(I) teaches that the semiconductor element and the substrate are held together and aligned through use of upper and lower jigs, JP(I) actually teaches away from the present invention as defined in independent claim 10.

Sliwa does not remedy any of the deficiencies of the JP(I) reference. Sliwa is directed to a method of joining a plurality of semiconductor devices into a pseudo monolithic substrate. As described in Sliwa, the plurality of IC segments 10 are mated together along their edges through the use of a floatation liquid 20. The floatation liquid 20 allows for the alignment of each of the IC segments 10 to form a co-planar pseudo monolithic substrate. See column 11, line 19 through column 12, line 36. Similar to JP(I), Sliwa does not teach or suggest that the center of the device electrode is not aligned with the center of the substrate electrode while the device is at least partially submerged in the liquid, and then that the center of the device electrode is aligned with the center of the substrate electrode when the solder bump is melted and the device is at least partially supported by the buoyant force of the liquid as required by independent claim 10.

Likewise, Sherry adds nothing to the disclosures of the JP(I) reference and/or Sliwa. Sherry merely discloses the use of ultrasonic energy to break down the surface tension of the solder so as to permit the solder to penetrate the openings in the mask and wet the exposed pads. There is no teaching or suggestion in Sherry that the center of the device electrode is positioned out of alignment with the center of the substrate electrode while the device is at least partially submerged in the liquid, and that the substrate electrode and the device electrode are joined and aligned with each other through the melting of the solder bump and the at least partial supporting of the device by the buoyant force of the liquid, as required by independent claim 10.

If one of skill in the art were to combine the teachings of the JP(I) reference, Sliwa and/or Sherry, one would not arrive at the present invention as defined in independent claim 10. At best, one of skill in the art would arrive a method of joining a device to a substrate wherein the device and the substrate are supported by upper and lower jigs such as those described in the JP(I) reference, thereby initially having the center of the device electrode and the center of the substrate electrode in alignment with each other before the melting of the solder to join the electrodes together. Therefore, inasmuch as the combined teachings of these references teach that the respective centers of the device electrode and the substrate electrode would be aligned prior to joining, the combination of references suggested in the Office Action actually teaches away from the present invention as defined in independent claim 10.

Accordingly, since the JP(I) reference, Sliwa and/or Sherry, either alone or combined, do not teach or suggest the limitations of independent claim 10 as described above, it is respectfully submitted that independent claim 10 patentably distinguishes over the art of record, and reconsideration and withdrawal of this rejection is respectfully requested.

Claims 11-19, 21-22 and 25-26 depend either directly or indirectly from independent claim 10 and include all of the limitations found therein. Each of these dependent claims include additional limitations which, in combination with the limitations of the claims from which they depend, are neither disclosed nor suggested in the prior art of record. Accordingly, claims 11-19, 21-22 and 25-26 are likewise patentable.

Claims 27-50

Among the limitations of independent claim 27 which are neither disclosed nor suggested in the prior art of record, is a method of joining a device to a substrate which includes:

> "placing a device having a device electrode on the solder bump while the device is in the liquid such that the device electrode is out of alignment with the substrate electrode"; and
>
> "melting the solder bump so as to cause the device electrode to align with the substrate electrode while the device and the substrate are in the liquid."

As described above, the combination of JP(I), Sliwa and/or Sherry neither discloses nor suggests placing the device electrode out of alignment with the substrate electrode while the device is in the liquid and then melting the solder bump so as to cause the device electrode to align with the substrate electrode, as required by independent claim 27. In fact, inasmuch as the combined teachings of the JP(I) reference, Sliwa and/or Sherry teach that the device electrode and the substrate electrode would be intentionally placed in alignment with each other through the use of upper and lower jigs as provided in the JP(I) reference, the combination of references suggested in the Office Action actually teaches away from the present invention as defined in independent claim 27. Accordingly, it is respectfully submitted that independent claim 27 patentably distinguishes over the art of record, and reconsideration and withdrawal of this rejection is respectfully requested.

Claims 28-50 depend either directly or indirectly from independent claim 27 and include all of the limitations found therein. Each of these dependent claims include additional limitations which, in combination with the limitations of the claims from which

they depend, are neither disclosed nor suggested in the prior art of record. Accordingly, claims 28-50 are likewise patentable.

Claims 51 and 52

Each of independent claims 51 and 52 are similar to independent claims 10 and 27, respectively, but require a plurality of device electrodes and a plurality of substrate electrodes. Therefore, it is respectfully submitted that each of independent claims 51 and 52 patentably distinguish over the prior art of record for at least the same reasons as set forth above with respect to independent claims 10 and 27. Accordingly, as the combination of references suggested in the Office Action actually teaches away from the present invention as defined in independent claims 51 and 52, it is respectfully submitted that claims 51 and 52 patentably distinguish over the art of record, and reconsideration and withdrawal of this rejection is respectfully requested.

The prior art made of record and not relied upon has been carefully reviewed. It is believed that these references, either alone or combined with any other references of record, do not render the pending claims unpatentable.

In addition, upon review of the file, Applicant has recognized that the Examiner had not initialed the non-patent reference contained in the Information Disclosure Statement filed on November 24, 1998 along with the present application. Since a brief description of the relevance of this reference was provided on pages 1-3 of the originally filed specification, Applicant respectfully requests that the Examiner consider and make this reference of record in the present application. For the Examiner's convenience, a clean copy of the original PTO-1449 Form is attached. Accordingly, Applicant respectfully

Application No.: 09/198,849 Docket No.: Y1929.0047/P047

requests that the Examiner return an initialed copy of the enclosed PTO-1449 Form with the next communication on this application.

In view of the foregoing, reconsideration of the rejections contained in the August 26, 2003 Office Action, and allowance of the present application with claims 10-19, 21-22 and 25-52 is respectfully and earnestly solicited.

Dated: November 14, 2003

Respectfully submitted,

By Richard LaCava

Richard LaCava
Registration No.: 41,135
DICKSTEIN SHAPIRO MORIN &
OSHINSKY LLP
1177 Avenue of the Americas
41st Floor
New York, New York 10036-2714
(212) 835-1400
Attorney for Applicant